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FINAL RPTS

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SUMMARY REPORT

ON

CONTRACT GT-8

EB-176 C

14 SEPT 1960

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[redacted] 25X1

SUMMARY REPORT ON CONTRACT GT-8

The development program with which this summary is concerned originated during the spring of 1958. At that time, [redacted] 25X1 had completed delivery of ten (10) special [redacted] which were made as 25X1 outlined in Drawing #1. Those [redacted] filled the immediate need of the 25X1 contracting agency; however, it was felt that certain aspects of the finished units needed to be improved if future applications for container vests were to materialize. With this in mind, an outline of the general areas that needed improvement was given to us in May 1958 by [redacted] Subsequently a proposal for a 25X1 development contract was prepared and submitted by [redacted] 25X1 [redacted] 25X1

[redacted] issued authority in July 1958 to proceed with the 25X1 development program and, under the same contract, the supply of ten (10) [redacted]. The [redacted] code number for this contract was GT-8 25X1 25X1

In brief, the objectives of the development program were to be:

(1) Improvement in the edges of the molded foam [redacted]. 25X1
(2) Improved means of harnessing the [redacted] to a wearer. 25X1
(3) Provide means for ventilation.

The specific requirements for the container vests were:

(1) Cavity 9-1/2" x 12" x 1/4" molded in the [redacted]. 25X1
(2) Single, easily accessible opening.
(3) Cavity and opening should be reasonably waterproof.

The first phase of our development program was concerned with the general problem of ventilation and comfort, since anything done to increase ventilation and comfort would change our approach to the molding and harnessing improvements which we hoped to make. At the beginning of our work a listing of various means for obtaining ventilation was made, and each idea was evaluated first as to its feasibility from the standpoint of molding technology and, second, its probable effect on the overall design of the [redacted] 25X1

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Those means for ventilation were:

(1) Molded holes spaced about an inch apart in the vest. Holes to be 1/8" diameter at top and 1/4" to 1/2" at bottom.
(2) Molded ribs.
(3) Molded nubbins.
(4) Mechanical Perforations.
(5) Porous matrix.

See drawings: #2

The following is an account of the work we did with each idea on means for obtaining ventilation.

Item 1 - <u>Molded Holes</u>

From the standpoint of technique the holes did not seem to be a problem, when first evaluated. However, the necessity of having the holes relatively close together presented an impossible task when actually attempted. The primary cause for failure was the immediate expansion of the foam at the time the mold was opened. Effort was made to reduce the expansion by prolonged cooling of the mold; it was not successful. At the time the mold opened the very rapid expansion of the molded vest would cause the foam to tear between some of the holes and bind securely between others; upon complete removal the molding was badly torn and deformed beyond use.

Item 2 - <u>Molded Ribs</u>

We thought from the start that we could mold ribs in the back of the [redacted]. A small mold was made in which some flat samples with ribs were molded. The ribs looked promising. The effect of ribs on the design of the container vest showed, however, that they were not the answer to ventilation. Ribs, to be effective, would have to be at least 1/4" deep and extend from edge to edge. Therefore, they would increase the thickness of the vest, both in the center and at the edges. A slight increase in the center could be allowed, but an increase at the edges could not be permitted, especially since the edges were already too thick. 25X1

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Item 3 - Molded Nubbins

Nubbins could be readily molded and had an advantage over ribs in that they could be located where needed and did not increase the edge thickness of the molded foam. Unfortunately it was found that soft nubbins of the same material as the body of the molding did not provide ventilation, as they would flatten against the body when put under slight compression. Nubbins were not the answer.

Item 4 - Mechanical Perforations

Under this idea classification only two techniques were tried, namely punching and burning holes in the molded part. Burned holes were unsightly and could not be easily made larger than 3/16" in diameter. Punched holes looked more promising as they were clean, well defined, and could be made in diameters of 1/8" to 1". One drawback to punched holes was that they could not be tapered.

Item 5 - Porous Matrix

Several commercial items which fell in this general category were screened for use as ventilating means. Open cell plastic and rubber foams were tested; however, all were so easily compressed that they exhibited no ventilating efficiency whatsoever. Hair felts were tried but were disagreeable when worn next to an undershirt and, in addition, were not available in thicknesses of 1/4" or less.

Toward the end of the development period several samples of an expanded three dimensional fabric called Trilok were evaluated. One of these samples, Trilok 6014-1-1, seemed to be an answer to part of our ventilation problem. This material was highly porous, light in weight, only 1/4" thick, and had a compression resistance high enough to prevent collapse when held against the body.

The means finally arrived at for obtaining maximum ventilation was a combination of three of the ideas just discussed. Drawing # 3 gives a cross-sectional view of this ventilating arrangement. The hemispherical cavities are molded in the foam, after which a punch is used to make the connecting tunnel to the outside surface. The molded [redacted] is then separated from the body by 1/4" layer of Trilok which has been cut to the general outline of the vest and held in position by the cloth harness cover.

[redacted] 25X1

The second phase of this development program was directed toward the improvement of the edges of the molded foam [redacted] and the related 25X1
problem of designing a suitable harness for the foam [redacted]. There were 25X1
two major complaints with the edges of the foam [redacted] which were supplied 25X1
under Contract GT-5: (1) the edges were thick and irregular in outline; (2) at certain locations the edges had a tendency to roll outward from the body of a wearer. We knew that a solution to these two problems had to be found, because they had a direct relation to the [redacted] 25X1
which could be achieved when a complete unit was in service.

An attempt was made to decrease the rolling tendency by molding the edge with a material somewhat firmer than the body of the [redacted] This work was 25X1
done in the fully contoured aluminum mold which we used to make the vests for Contract GT-5. This mold, though accurate enough for the job intended, did have an irregular profile in the areas which defined the edge of the foam [redacted]. 25X1

It became apparent that a flat mold, one that had the profile of the edge defined in one plane instead of three, might help reduce the tendency to roll, and at the same time offer an easier means for obtaining a uniform thin edge. A flat mold was made.

Moldings were again made of a combination firm and soft foam. The results were about the same as with the contoured mold. The firm and soft materials did not mold into a uniform structure. The baking cycle for each material was different, and we failed to find a cycle at which both would work. However, the flat mold did provide an easy means for controlling the thickness of the edges.

Some effort was made to reduce edge rolling by using laminating techniques. This approach received very little attention after we found out that laminating would increase edge thickness beyond a usable value.

At this point in our work we decided that the edge rolling problem could more likely be solved if it were integrated with the harness problem. An evaluation was made of the harnessing problem as related to what we had already done and what we were expected to accomplish with this development program. The original strapping arrangement used on the vests made under Contract GT-5 was obviously not suitable. Three distinct means of harnessing were considered.

(1) Inter-laminating a piece of cloth around the edge of the foam unit and then attaching straps and hardware to the cloth edge.

 25X1

[redacted]

(2) Design a corset type unit out of an elastic open mesh fabric, thereby eliminating straps and hardware.

(3) A peripheral harness made of light weight cotton fabric to which elastic webbing and tie tapes would be attached.

The first two ideas were eliminated for various reasons, among which were fabrication difficulties, interference with donning and doffing, and harness not separable from foam [redacted] All work with harnessing was thereafter concentrated on the design of a peripheral harness which could be easily separated from the foam [redacted]. Fortunately this design also helped eliminate to a large extent the edge rolling problem. Exhibit A is a typical peripheral harness. In essence it is a bag completely closed around the edges but open in front and back. This arrangement permits the foam [redacted] to be inserted or removed without disrupting the harness straps. 25X1 25X1 25X1

At the same time the work on ventilation, edges and harnessing was being done, we spent considerable effort on the container [redacted] mentioned in the contract. From the outset it became apparent that a cavity of the size proposed (9-1/2" x 12" x 1/4") could not be enclosed in the available [redacted] area. A new minimum area was established at (8-1/4" x 11" x 1/4"). 25X1 25X1

A group of tests was made with the contoured mold used under Contract GT-5. We attempted to form a cavity (8-1/4" x 11" x 1/4") directly in the molded foam [redacted] Special insert plates were made for the mold. However, none of the tests were successful because the insert plate would move out of position. Any serious effort to stabilize the plates would involve the additional expenditure of two to three thousand dollars on new molds and insert plates. We decided then that the cavity [redacted] would have to be made out of a molded foam front section and a sheet of 1/8" foam for the back section. 25X1 25X1

These two sections would be glued together to form an internal cavity with a slotted opening in the back. If needed, interlayers of vinyl film could be simultaneously glued so that the cavity in effect would be lined with the vinyl film. See exhibit B.

A prototype of this container mounted in a harness of the latest design was made and submitted to the contracting agency during the winter of 1958-59. This culminated our work under Contract GT-8.

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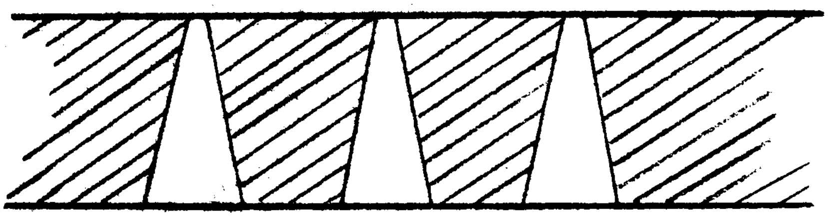
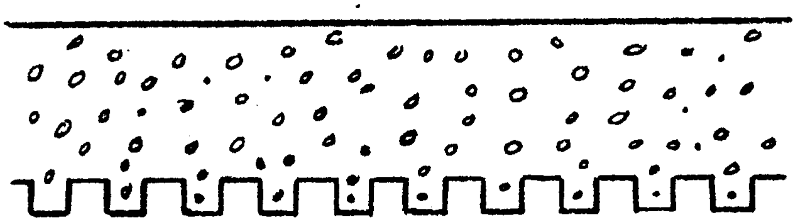
MEANS FOR VENTILATION

DRAWING #2

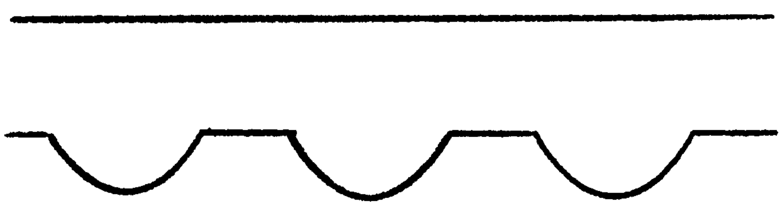
MOLDED HOLES



MOLDED RIBS



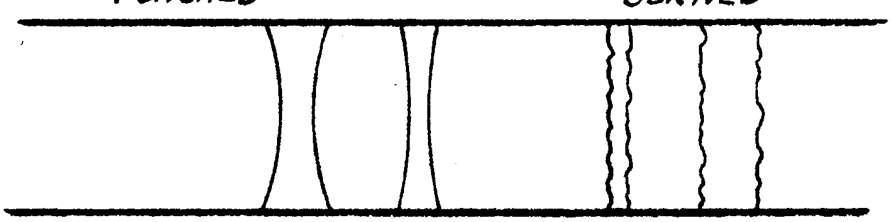
MOLDED NUBBINS



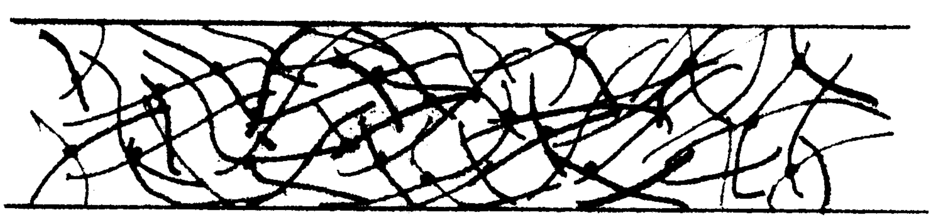
MECHANICAL PERFORATIONS

PUNCHED

BURNED



POUROUS MATRIX



DRAWING #3

FINAL MEANS FOR VENTILATION